



Water Technologies for Rural Texas

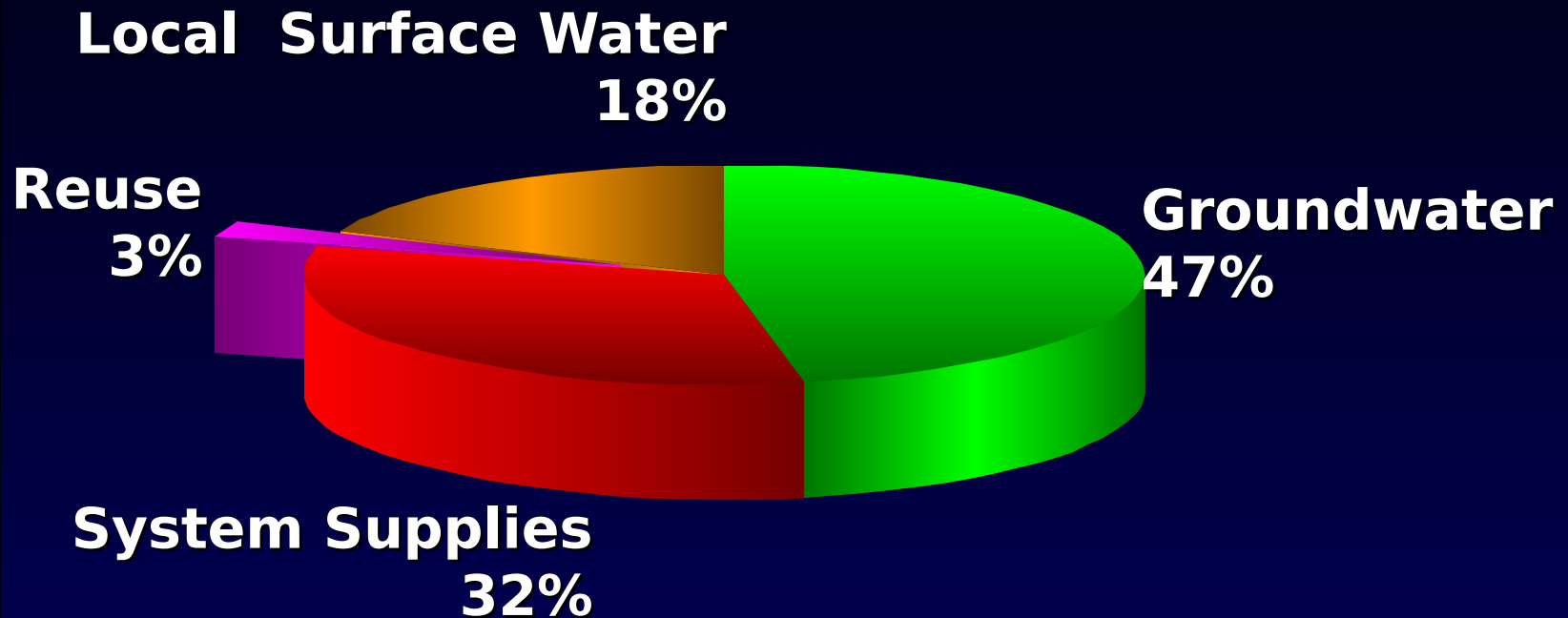
Water Reuse and Recycling

Alan H. Plummer, Jr., P.E., DEE

December 2, 2003



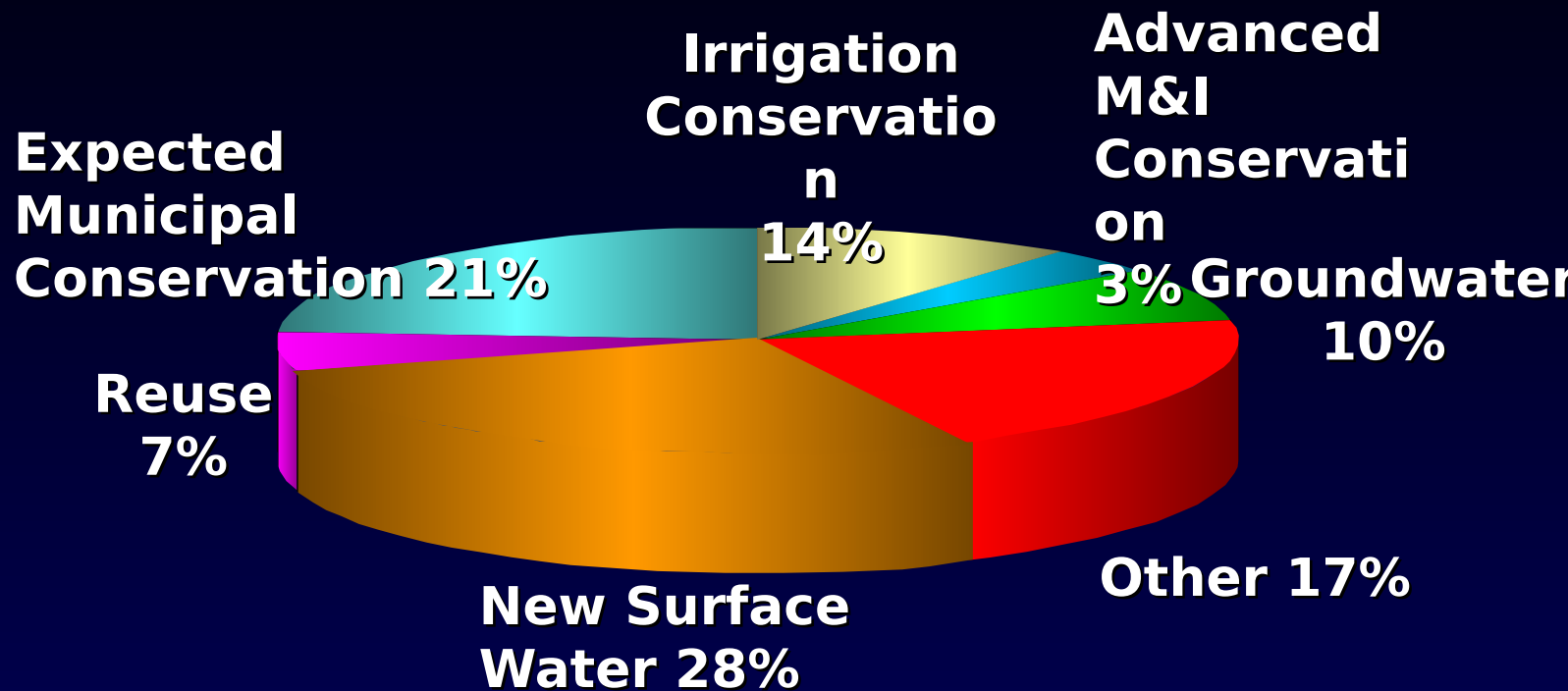
Available Water Supplies Statewide (YR 2000)



Total Available Supply = 18.4 million ac-ft/yr



Projected Water Supply Development

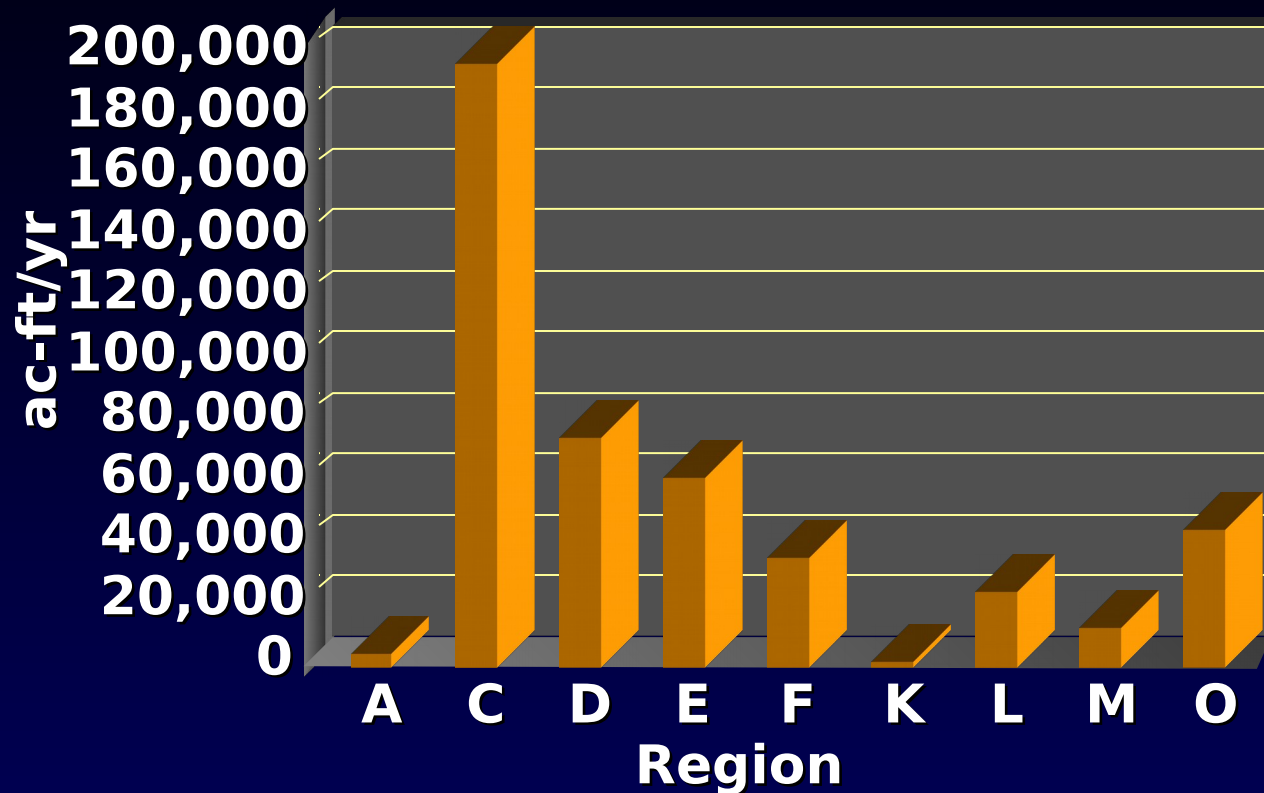


Projected new 2050 supplies ~ 7 million ac-ft/yr



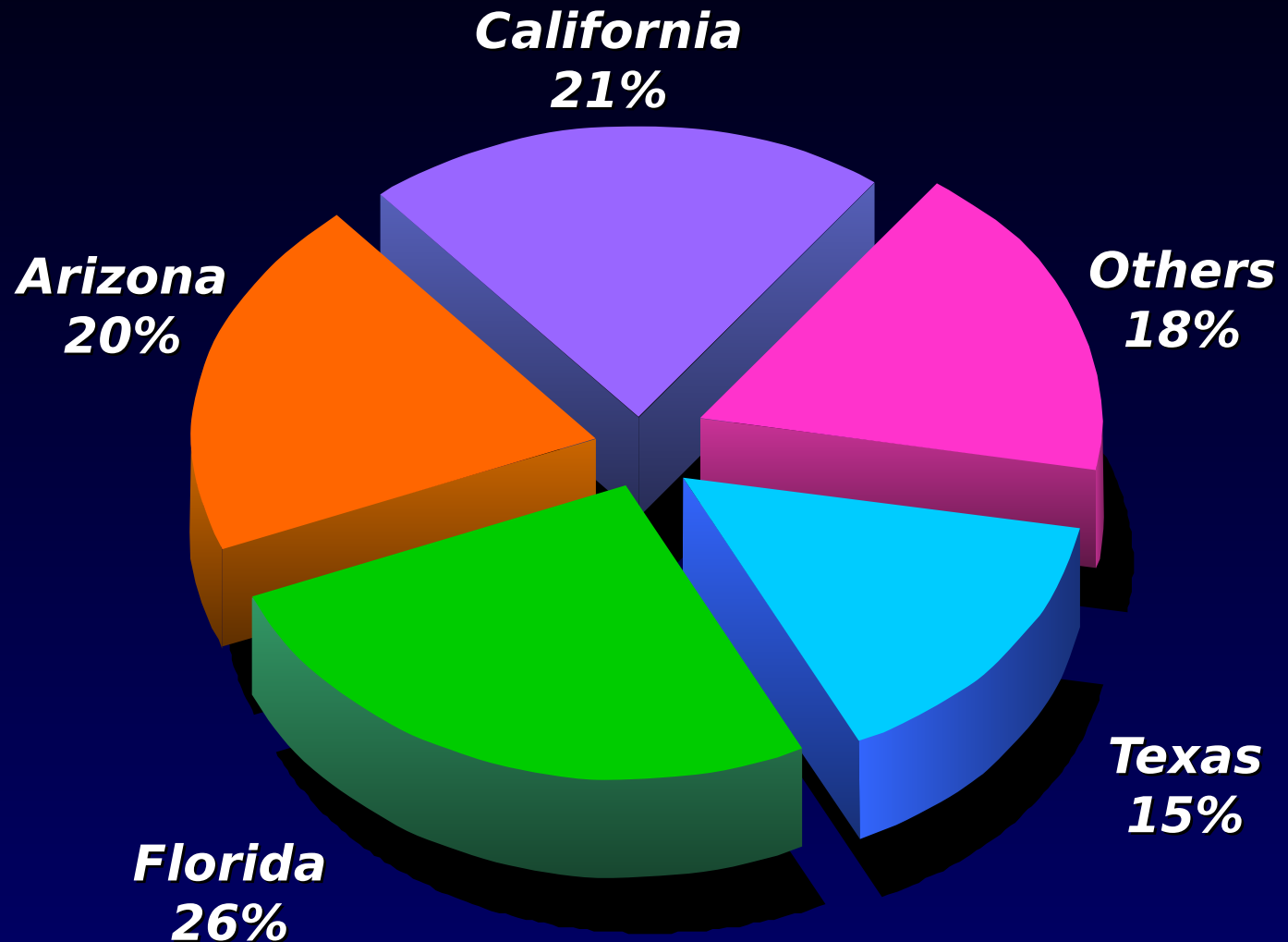
Reuse Availability by Region

(YR 2000)



Total Reuse Availability = 460,000 ac-ft/yr

Successful Reuse USA Reuse



California Statistics

- ♦ **234 wastewater treatment facilities provide water for approximately 4,840 sites**
- ♦ **About 525,000 ac-ft/yr (468 MGD) of treated municipal wastewater is currently being recycled.**



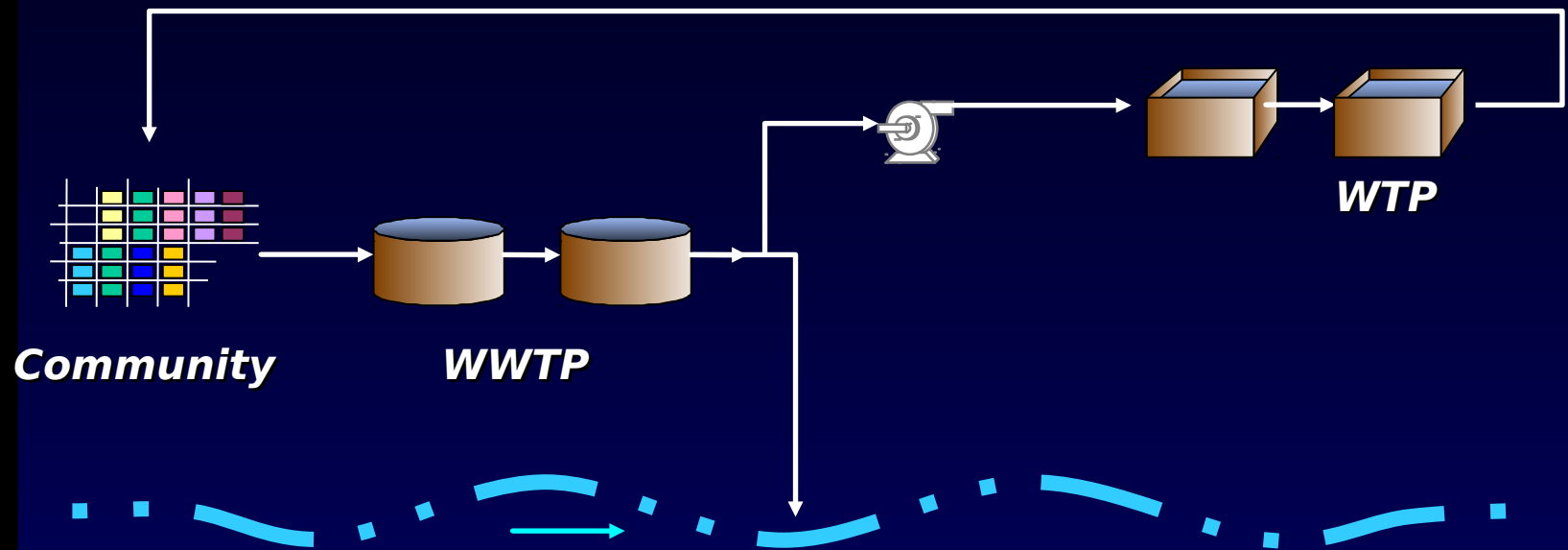
(Source: State Water Resources Control Board, 2002)

Florida Statistics

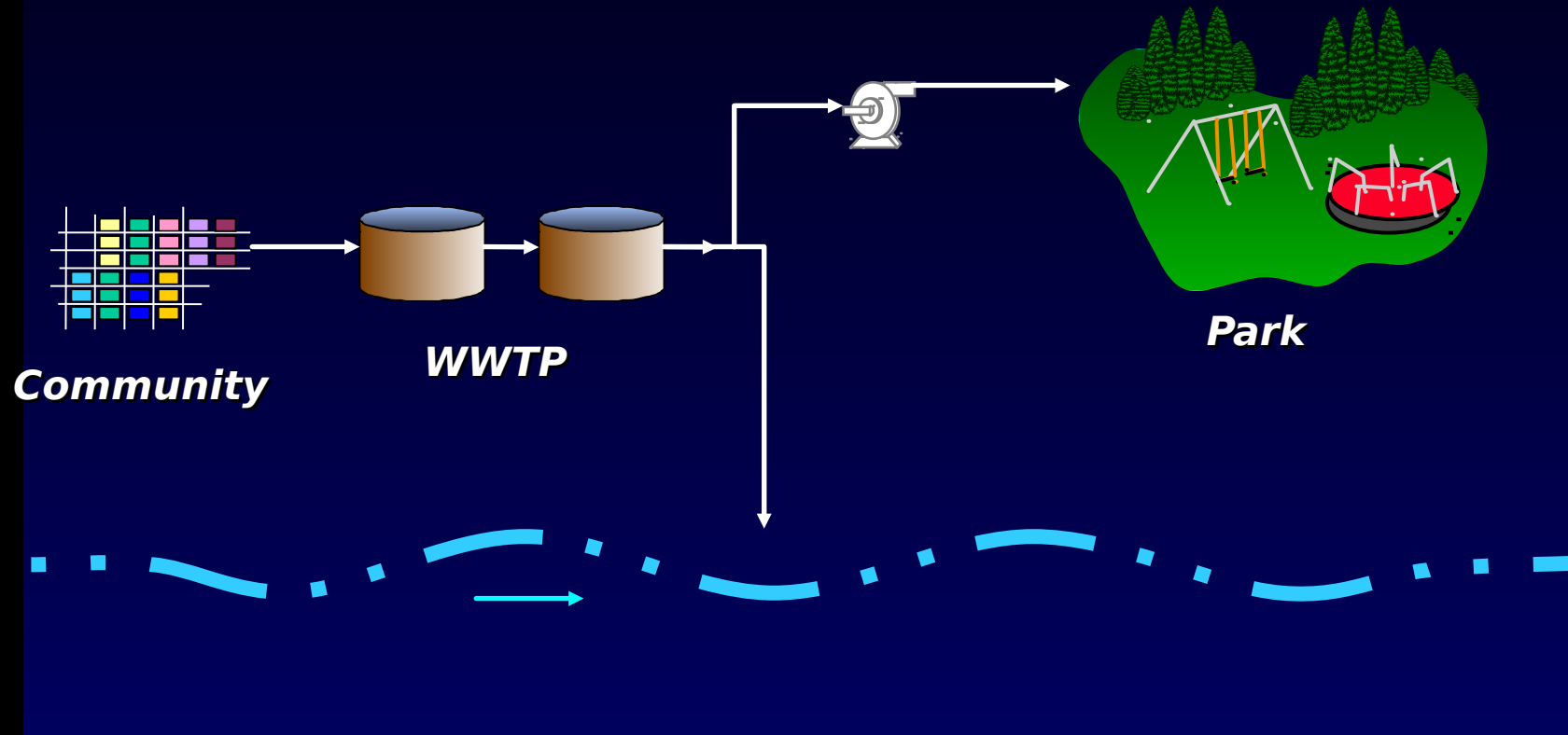
- ♦ **461 domestic wastewater treatment facilities provide water for 431 reuse systems**
- ♦ **Capacity of reuse facilities was 1151 MGD (2001)**
- ♦ **About 654,600 ac-ft/yr (584 MGD) of reclaimed water used (2001)**



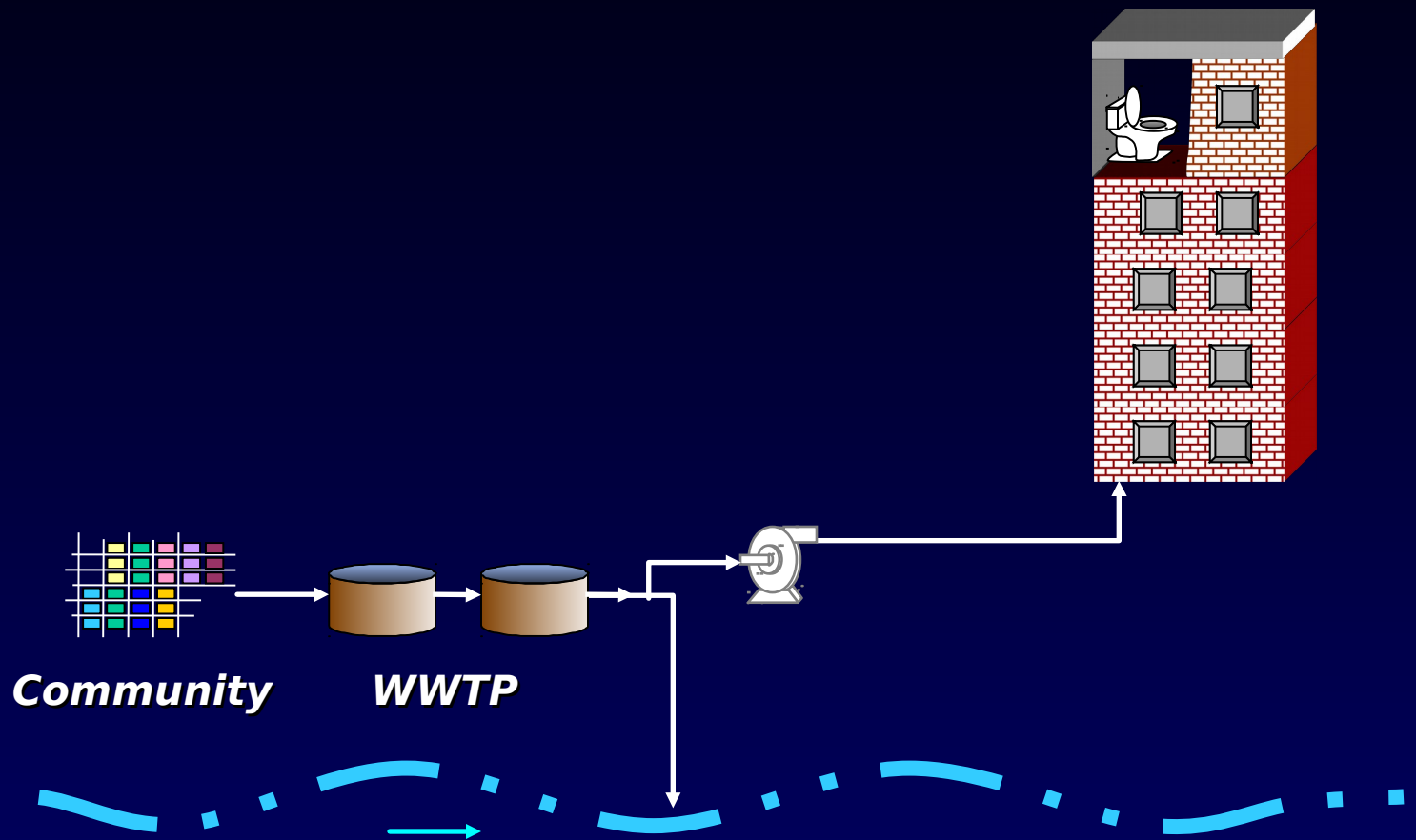
Direct Reuse - Drinking Water Supply (Expanded Advanced Treatment)



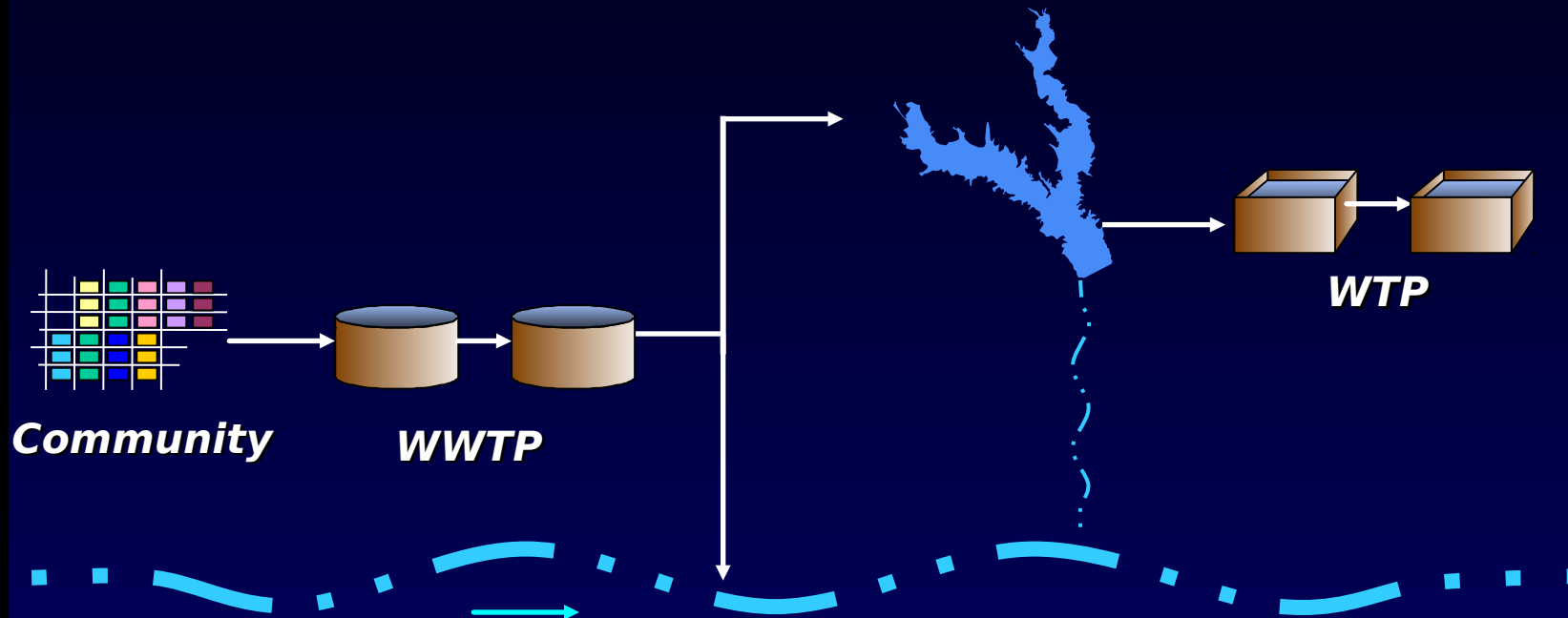
Direct Reuse (Park Irrigation) Type I Water Quality



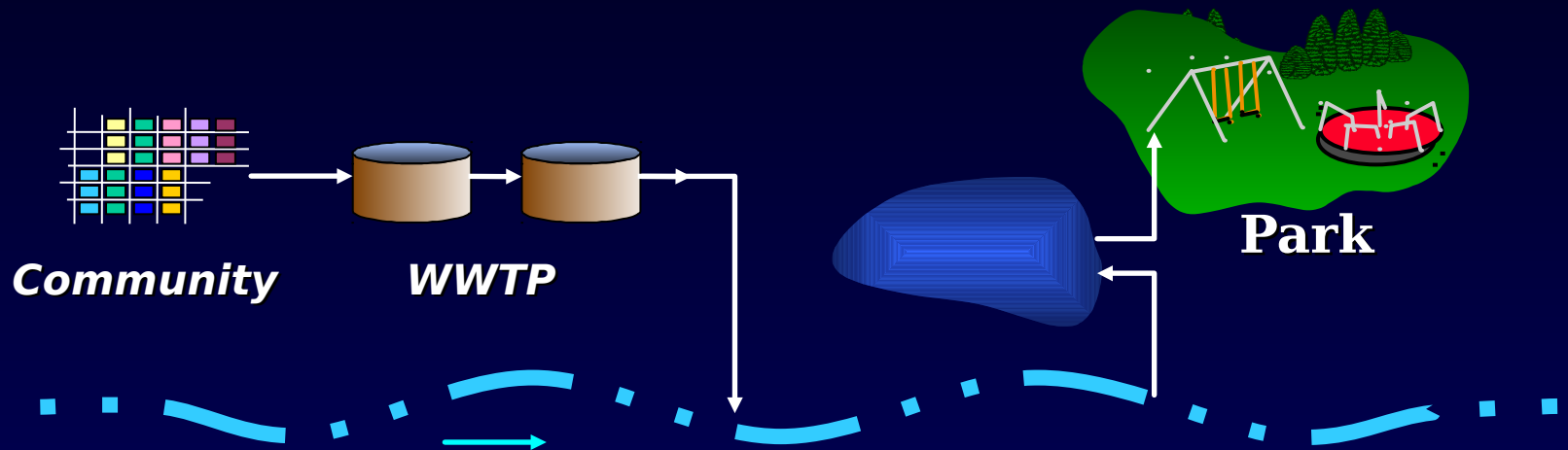
Direct Reuse (Toilet Flushing etc.) Type I Water Quality



Indirect Reuse Drinking Water Supply (Multiple Barriers - Advanced Treatment/ Detention Time/Blending)



Indirect Reuse (Park Irrigation)



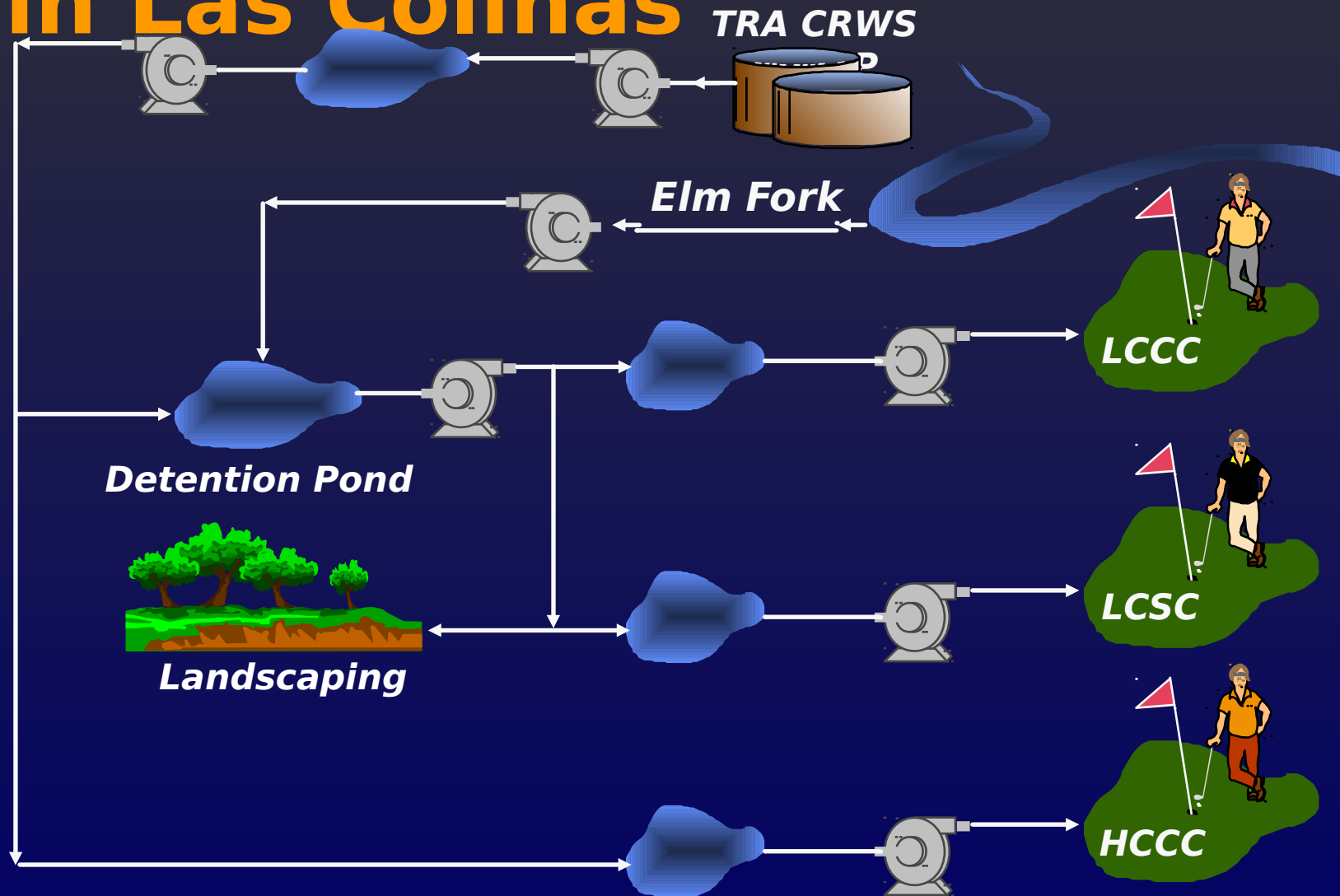
Las Colinas Water Reuse



Las Colinas Water Reuse



System Schematic Water Reuse in Las Colinas



Raw Water Quantities by Type of Use

<i>Type of Use</i>	<i>Surface Water (BG)</i>	<i>Reclaimed Water (BG)</i>	<i>Total Water (BG)</i>
<i>Water surface evaporation makeup</i>	<i>2.976</i>	<i>1.903</i>	<i>4.879</i>
<i>Median landscape and open space</i>	<i>0.523</i>	<i>0.335</i>	<i>0.858</i>
<i>Golf course</i>	<i>3.738</i>	<i>2.340</i>	<i>6.128</i>
<i>Corporate headquarters landscape area</i>	<i>0.284</i>	<i>0.180</i>	<i>0.464</i>
<i>Totals</i>	<i>7.521</i>	<i>4.808</i>	<i>12.329</i>



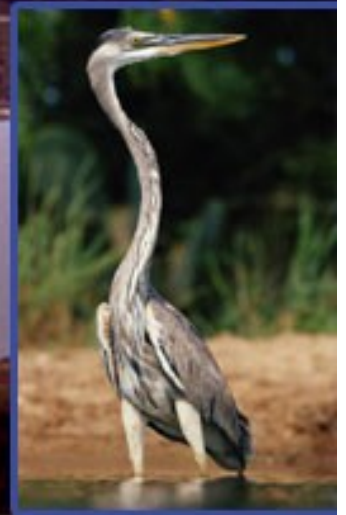
(Note: Raw water provided for irrigation of corporate headquarters since 1991 only.)

richland-chambers

WETLAND WATER REUSE PROJECT



TEXAS
PARKS &
WILDLIFE



District Long-Range Water Supply 1990 Planning

- ◆ **Determined that additional water supply is needed**
- ◆ **Identified and evaluated several options**
- ◆ **Concluded that District should pursue option to divert water from Trinity River into District Reservoirs**



District Investigation of Trinity River Diversion Option

- ♦ **Trinity River Quality Assessment indicated that polishing treatment is required**
- ♦ **Evaluated several treatment options**
- ♦ **Selected Wetland Treatment System**



Operating Concept for Proposed District Supply Project

EXISTING SUPPLY

Richland-Chambers
Cedar Creek
Bridgeport
Eagle Mtn.
Benbrook
Arlington



FUTURE SUPPLY

Richland-Chambers

Trinity River

Cedar Creek

Diversion

Diversion

Phase II Wetland

Current Wetland



District Pilot-scale Wetland Research - To Plant or Not

To Plant?

- ♦ Native plants were planted in two trains while no planting was done in the third train
- ♦ Research determined that only selective planting is r
- ♦ The District will save projected \$6 million by minimal planting in full-scale system



District Pilot-Scale Wetlands Research - Can Plants Survive Periodic Flooding?

Some of the potential wetland sites were in areas that periodically experience flooding conditions

December 1992






Plants demonstrated
ability to recover from
flooding

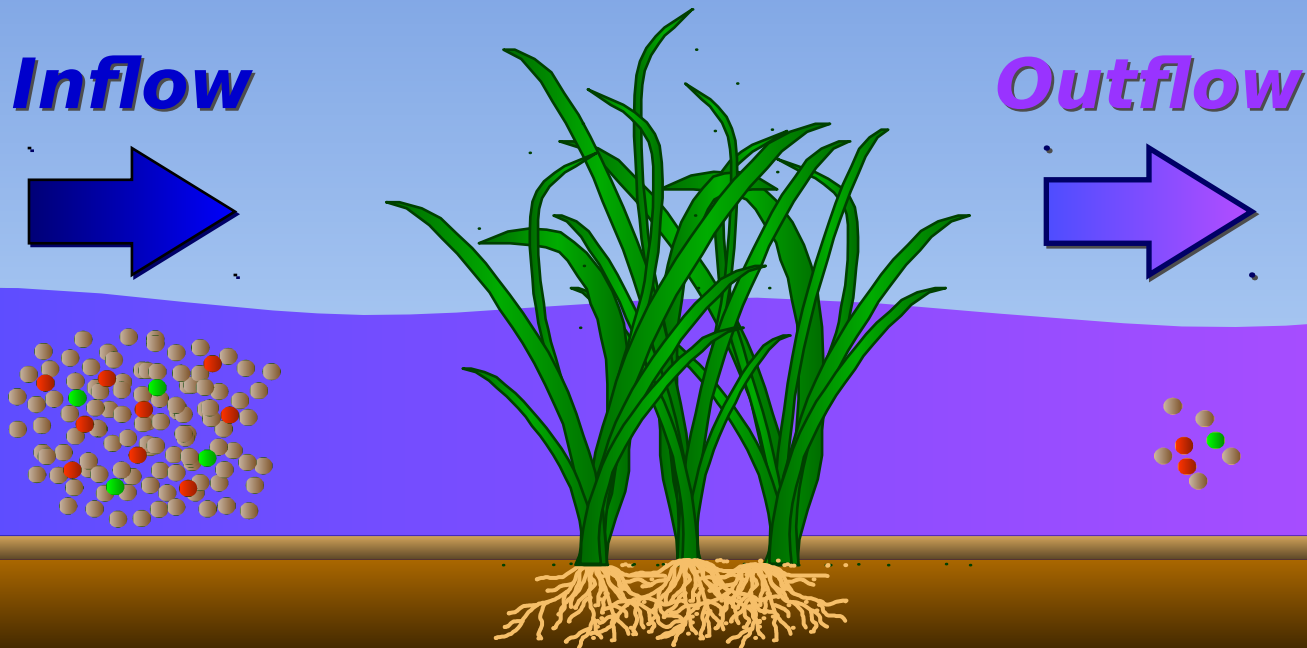


March 1994



Pilot-Scale Wetland Research

Performance Summary of Pilot-Scale System	
Parameter	Percent Mass Removed
 Total Suspended Solids	> 95%
 Nitrogen	> 80%
 Phosphorus	> 65%



District Field-Scale Demonstration Wetland System



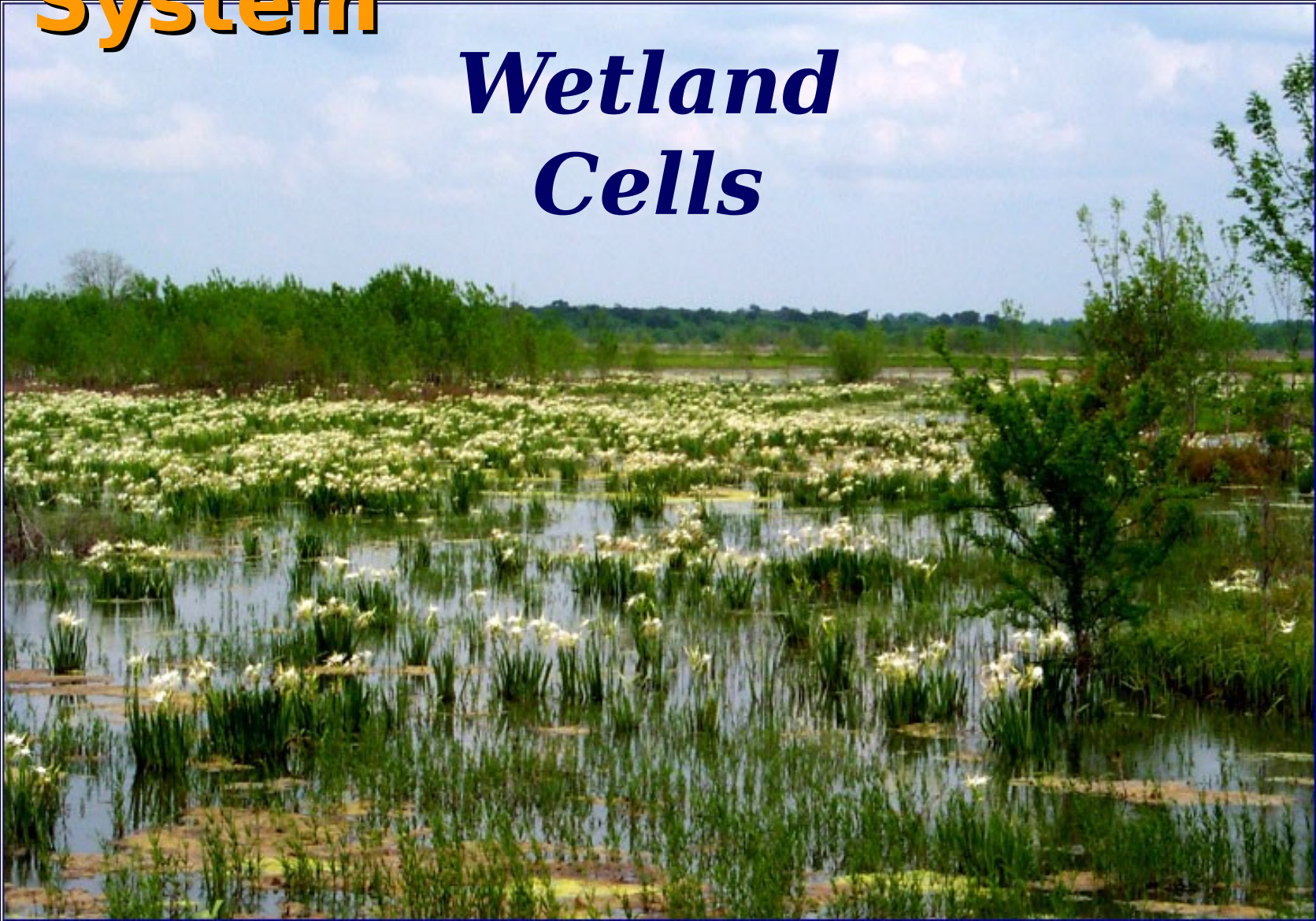
District Field-Scale Demonstration Wetland System



*Trinity River Pump
Station*

District Field-Scale Demonstration Wetland System

Wetland Cells



Integrated Water Supply and Wildlife Habitat System

- ♦ **Is a reality due to the commitment of the District and TPWD**
- ♦ **Is the first of its kind in the nation**
- ♦ **Provides multiple benefits of both water supply and wildlife habitat**

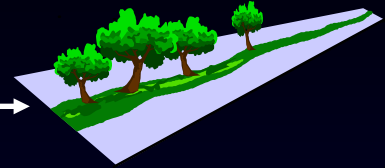


Reclaimed Water Use in Odessa

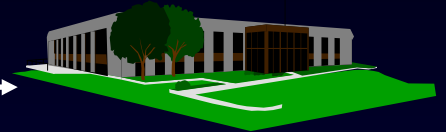
**Bob Derrington
Water Reclamation Plant**



TXDOT



University



Playground



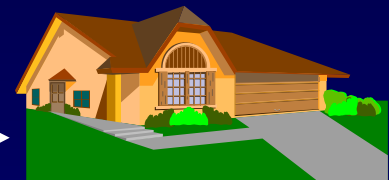
Golf Course 1



Golf Course 2



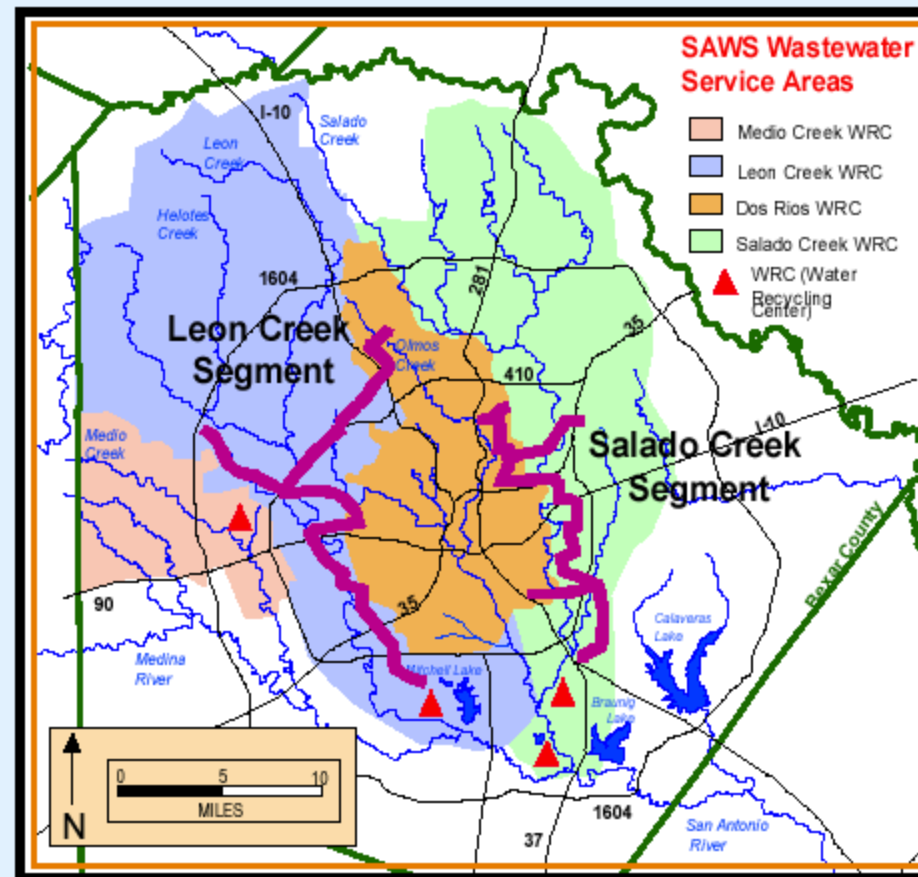
**Residential
Irrigation**





Recycled Water Project

- Project to supply 35,000 acre-feet per yr
- Replaces current uses of potable water
 - Irrigation
 - Heating and Cooling towers
 - River flow
- 25,000 ac/ft committed
- Over 13,000 acre-ft currently online
- Total Cost: \$125m

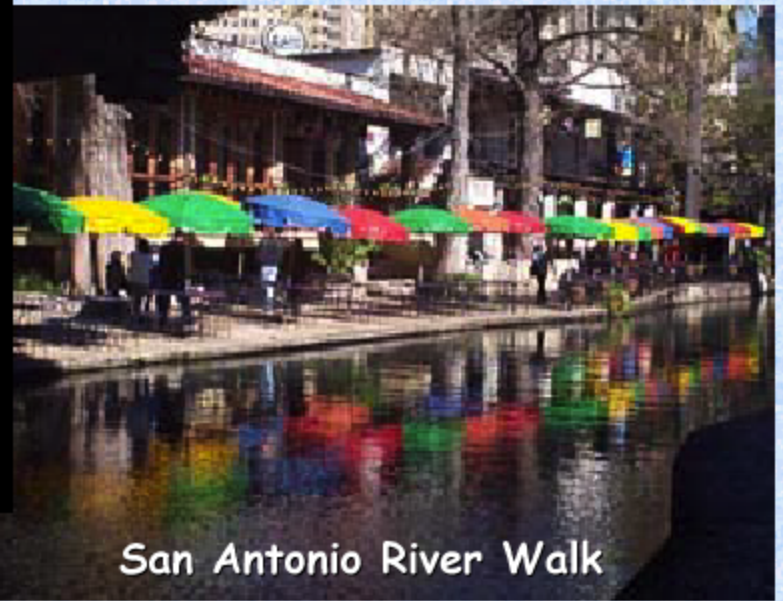




Recycled water uses



Mission del Lago golf course



San Antonio River Walk



Wolff Stadium



VA National Cemetery